

Assessment of the Incidence and Risk Factors Associated with Sore Throat after General Anesthesia with Endotracheal Intubation: An Observational Study

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Abstract

Aim: The aim of the present study was to determine the incidence and associated risk factors of postoperative sore throat following general anesthesia with endotracheal intubation.

Methods: The study was conducted at department of Anesthesia, Anugrah Narayan Magadh Medical College and Hospital, Gaya, India for 12 months and patients who underwent endotracheal intubation under general anesthesia were enrolled in the study. A total of 100 patients were included into the study.

Results: A total of 100 patients were included into the study. The study showed majority of the subjects were aged between 18-65 age group and 60% were male in the study. Out of the patients who develop postoperative sore throat 26 patients (86.66%) were found between 18 and 65 years and 4 patients (13.34%) aged above 65 years. Majority of the patients underwent general surgery (35%) followed by endocrine, neurologic and orthopedic 15% in each. Majority of the patients belonged to ASA 1 (64%) and mallampati 1 (65%). The size of ETT mostly used was 6.5 mm in 36 patients followed by 6 mm in 34 patients. In 52 patients, 4 number laryngoscope blade was used. 6.5 mm size of ETT was used followed by 6 mm. We found that size of Endotracheal intubation and size of laryngoscope blade showed statistically significant association with the post-operative sore throat with the size of ETT.

Conclusion: The result of this study showed that the larger the size of ETT and laryngoscope blade, the higher the incidence of postoperative sore throat. Even though endotracheal intubation is mandatory for good airway protection during surgical procedures, we recommend using the smaller ETT size (6 mm, 6.5 mm ID) and smaller laryngoscope blade (size 2, size 3).

Keywords: Post-operative Sore throat, Endotracheal tube, Anesthesia

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Introduction

Postoperative sore throat is a condition in which the mucous membrane in the throat is inflamed particularly when general anesthesia with endotracheal intubation is

used. This is because the conduct of this technique of anesthesia often involves interference with the normal airway mucosal barrier mechanisms by way of

instrumentation, or interference with the normal mucosal or ciliary activities due to inhalation of unhumidified anesthetic gases. The interference in many cases may lead to trauma, foreign body contaminations, mucosal dryness and airway irritation, which manifests in various ways in the postoperative period. [1] The exact mechanism of POST is not clear but it appears to be an inflammatory process since the tracheal mucosa has been found to release inflammatory mediators after intubation. However the exact anatomical locations of sore throat still remain uncertain in patients. Some of associated POST factors include type and size of airway device, technique of insertion, use of lubricant, cuff pressure, length of procedure, and seniority of anesthetist. [2]

Sore throat is a common uncomfortable distressing sequel of tracheal intubation which contributes to post-operative morbidity and patient dissatisfaction following general anesthesia. These represent a significant negative aspect of surgical care. [3] Awareness of the variables associated with an increased incidence of POST will allow health care providers to minimize combinations of risk factors, reduce the incidence and severity of POST, and improve a patient's anesthesia experience. [4] The expression of postoperative sore throat constitutes a number of sign and symptoms. For example, sore throat is an ordinary expression of pharyngitis, which by itself can have a number of causes. It may also include a variety of symptoms including pain and discomfort, laryngitis, tracheitis, hoarseness, cough or dysphagia. [5] Postoperatively, it seems reasonable that most of the signs and symptoms are the result of mucosal injury which leads to inflammation caused by the process of airway instrumentation. Also, the postulated etiology is mucosal dehydration or edema, tracheal ischemia secondary to the pressure of Endotracheal Tube (ETT)

cuffs, aggressive oropharyngeal suctioning, and mucosal erosion from friction between delicate tissues and the ETT and trauma from tracheal intubation. [6,7] However, the etiology and the exact anatomical location of POST is still remains uncertain. [8]

It is widely accepted that some complications related delivery of anesthesia care is inevitable. Post-operative sore throat is one of the potential minor complications of anesthesia which may increase patient's morbidity. But it being minor does not mean that it should be ignored since it has obvious consequences on surgical and anesthesia outcomes. It can lead to patient dissatisfaction and discomfort after surgery and can delay a patient's return to normal routine activities. [9]

The aim of the present study was to determine the incidence and associated risk factors of postoperative sore throat following general anesthesia with endotracheal intubation.

Materials and Methods

The study was conducted at Anugrah Narayan Magadh Medical College and Hospital, Gaya, India for 12 months and patients who underwent endotracheal intubation under general anesthesia were enrolled in the study. A total of 100 patients were included into the study.

Inclusion criteria:

Age between 18 and 80 years; in the American Society of Anesthesiologists (ASA) I and II physical status; in need of oral and maxillofacial surgery; with preoperative case data and anesthesia record sheet; the patients were evaluated in the postoperative period for the duration of their hospital stay.

Exclusion criteria:

Patients with obstructive respiratory disease (n=3); patients with severe systemic disease (n=2); patients with acute upper respiratory tract infection (n=5); patients

with severe drug dependence and mental disorder (n=4); patients with acute pharyngitis (n=3). The study was performed in accordance with the Declaration of Helsinki and was approved by the Ethics Committee. Written informed consent was waived due to the study's retrospective design. All patients data were anonymized and maintained with confidentiality.

Data analysis plan

After data collection, data was summarized and coded. Data was entered into SPSS

version 20.0 for data cleaning up and analyzing. Proportion was calculated for all categorical variables, bivariate analysis was done for each independent variable with dependent variable and binary logistic regression was done to measure association between dependent and each independent variable while controlling other variables. P value and 95% C.I was used to judge significant of association. P-value <0.05 would be used as cut off point.

Results

Table 1: Socio-demographic characteristics

		Frequency	Percent
Age	18-65	85	85
	>65	15	15
Sex	Male	60	60
	Female	40	40

A total of 100 patients were included into the study. The study showed majority of the subjects were aged between 18-65 age group and 60% were male in the study.

Table 2: Age and gender distribution who developed POST

Variables	Yes	No	Total
Gender			
Male	20	40	60
Female	10	30	40
Total	30	70	100
Age			
18-65	26	59	85
>65 years	4	11	15
Total	30	70	100

Out of the patients who develop postoperative sore throat 26 patients (86.66%) were found between 18 and 65 years and 4 patients (13.34%) aged above 65 years. According to gender distribution, 20 males and 10 females developed POST.

Table 3: Type of surgery

Type of surgery	Frequency	Percent
Gynecologic	8	8
Endocrine(thyroid)	15	15
General (Breast, intestinal, Colon, Appendectomy)	35	35
Thoracic	3	3
Urologic	9	9
Neurologic	15	15
Orthopedic	15	15

Majority of the patients underwent general surgery (35%) followed by endocrine, neurologic and orthopedic 15% in each.

Table 4: ASA Status, Mallampati grade size of ETT used and size of laryngoscope blade used

		Frequency	Percent
ASA	ASA 1	64	64
	ASA 2	32	32
	ASA 3	4	4
	ASA 4	0	0
Mallampati	Mallampati 1	65	65
	Mallampati 2	30	30
	Mallampati 3	3	3
	Mallampati 4	2	2
Size of ETT	6 mm	34	34
	6.5 mm	36	36
	7 mm	22	22
	7.5 mm	8	8
Size of laryngoscope blade used	2	0	0
	3	48	48
	4	52	52

Majority of the patients belonged to ASA 1 (64%) and mallampati 1 (65%). The size of ETT mostly used was 6.5 mm in 36 patients followed by 6 mm in 34 patients. In 52 patients, 4 number laryngoscope blade was used.

Table 5: Size of ETT used sore throat cross tabulation

Size of ETT	Continuous Throat Pain		Total
	1	2	
6 mm		1	25
6.5 mm		5	31
7 mm		10	13
7.5 mm		14	1
Total		30	70

6.5 mm size of ETT was used followed by 6 mm. We found that size of Endotracheal intubation and size of laryngoscope blade showed statistically significant association with the post-operative sore throat with the size of ETT.

Discussion

General anesthesia is the most commonly used type of anesthesia for a surgical procedure involving an ETT or LMA for the maintenance of airway patency, resulting in postoperative complications. [10-12] A postoperative sore throat is a pain

or discomfort in the patient's throat after receiving general anesthesia under tracheal tube or laryngeal mask airway. [13,14] The multiple factors that contribute to post-operative sore throat include the choice of airway device, high tracheal tube cuff pressure, surgical manipulation of the airway, varying circuit humidification, airway suctioning, dehydration, and the type and length of anesthesia and surgery. Postoperative sore throat is a condition in which the mucous membrane in the throat is inflamed particularly when general anesthesia with endotracheal intubation is

used. This is because the conduct of this technique of anesthesia often involves interference with the normal airway mucosal barrier mechanisms by way of instrumentation, or interference with the normal mucosal or ciliary activities due to inhalation of unhumidified anesthetic gases. The interference in many cases may lead to trauma, foreign body contaminations, mucosal dryness and airway irritation, which manifests in various ways in the postoperative period. [15] The exact mechanism of POST is not clear but it appears to be an inflammatory process since the tracheal mucosa has been found to release inflammatory mediators after intubation. However the exact anatomical locations of sore throat still remain uncertain in patients. Some of associated POST factors include type and size of airway device, technique of insertion, use of lubricant, cuff pressure, length of procedure, and seniority of anesthetist. [16]

We found that size of endotracheal intubation and size of laryngoscope blade showed statistically significant association with the post-operative sore throat with the size of ETT. Hohlrieder et al reported that the use of a 7.5–8 mm endotracheal tube for men and 6.5–7 mm for women contributed to lower POST rates compared with larger sizes of the endotracheal tube. [17] Besides, limiting cuff pressures might reduce POST occurrence. [18] Decreased blood flow to the tracheal mucosa might cause ischemic damage ranging from minor irritation to tracheal stenosis when the cuff pressure is above 30 cm H₂O. [19,20] There is a study in Iran showed that POST occurred in 13.7% of all patients who received general anesthesia, [21] while another study in the UK showed the incidence to be 63.9%. [22]

POST is thought to be caused by chronic inflammatory stimulation of the airway (device factors), leading to abrasion of the airway mucosa and the release of neurotransmitters. [23] When men and women were exposed to the same pain

stimulus, women assessed the level of pain more strongly. [24] Additionally, women tended to have a lower pain tolerance threshold than men, suggesting that female gender was a factor influencing POST recognizing and expressing POST. [25] Of note, anxiety and psychological stress would increase pain. [26] In this study there was no significant association between age and occurrence of POST. A study conducted in Watford general Hospital, United Kingdom, also showed no significant difference in the incidence of sore throat between age groups studied. Type of surgery, presence of Ng tube, number of attempts at laryngoscopy and intubation all have no significant association with compliance of sore throat in this study. [27]

Conclusion

Sore throat was found to be more common with certain patient, anesthetic and surgical related factors. The prevalence of postoperative sore throat was (30%) in this study. Size of ETT and size of Laryngoscope blade were the independent risk factors for post-operative sore throat. This is most likely due to trauma induced by large laryngoscope blade and tight fitting ETTs release inflammatory mediators and forming edema around throat. So we recommend using smaller sized ETT (6-6.5 mm) and small sized laryngoscope blade (2 & 3) to minimize pressure-induced trauma on airway mucosa.

References

1. Obsa MS, Adem AO, Bancha B, Bati T, Gemechu AD, Tilla M, Nugusse MA, Wosene NG, Gobena N, Hamu A, Abdulkadir S. Global incidence and risk factors of post-operative sore throat among patients who underwent surgery: A Systematic Review and Meta-Analysis. *International Journal of Surgery Open*. 2022 Aug 31:100536.
2. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and

- treatment. *Anesthesia*. 1999; 54(5): 44-453.
3. Bagchi D, Mandal MC, Das S. Intravenous dexamethasone to reduce Postoperative score throat. *Jour Anesthesi & clinpharmaco*. 2012; 28 (4): 477-480.
 4. Christensen AM, Willemoes-Larsen H, Lundby L, Jakobsen KB. Postoperative throat compliants after tracheal intubation. *Br J Anaesth*. 1994;7 3(6): 786-787.
 5. Gemechu BM, Gebremedhn EG, Melkie TB. Risk factors for postoperative throat pain after general anaesthesia with endotracheal intubation at the University of Gondar Teaching Hospital, Northwest Ethiopia, 2014. *The Pan African Medical Journal*. 2017;27.
 6. Zuccherelli L. Postoperative upper airway problems. *Southern African Journal of Anaesthesia and Analgesia*. 2003 May 1;9(2):12-6.
 7. Navarro RM, Baughman VL. Lidocaine in the endotracheal tube cuff reduces postoperative sore throat. *Journal of clinical anesthesia*. 1997 Aug 1;9(5):394-7.
 8. Birhanu Mengistu S, Akalu L. Magnitude and associated risk factors of post-operative sore throat following surgery by general anesthesia with endotracheal intubation in black lion hospital, addis ababa, Ethiopia. *Int J Anesthesiol Res*. 2017 Feb 24;5(2):40-9e13.
 9. Ahmed A, Abbasi S, Ghafoor HB, Ishaq M. Postoperative sore throat after elective surgical procedures. *Journal of Ayub Medical College Abbottabad*. 2007;19(2):12-4.
 10. Brown EN, Purdon PL, Van Dort CJ. General anesthesia and altered states of arousal: a systems neuroscience analysis. *Annual review of neuroscience*. 2011 Jul 21;34:601-28.
 11. Jaensson M, Lassinantti Olowsson L, Nilsson U. Does the size of the endotracheal tube affect the risk for sore throat following surgery in woman?: a randomized controlled study. In 9th World Congress for Nurse Anesthetists, Haag, Nederlanderna, 4-8 juni 2010 2010.
 12. Higgins PP, Chung F, Mezei G. Postoperative sore throat after ambulatory surgery. *British journal of anaesthesia*. 2002 Apr 1;88(4):582-4.
 13. McHardy F, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anaesthesia*. (1999) 54(5): 444-53.
 14. Scuderi PE. Postoperative sore throat: more answers than questions. *Anesth Analg*. (2010) 111(4):831-2.
 15. Obsa MS, Adem AO, Bancha B, Bati T, Gemechu AD, Tilla M, Nugusse MA, Wosene NG, Gobena N, Hamu A, Abdulkadir S. Global incidence and risk factors of post-operative sore throat among patients who underwent surgery: A Systematic Review and Meta-Analysis. *International Journal of Surgery Open*. 2022 Aug 31:100536.
 16. McHardy FE, Chung F. Postoperative sore throat: cause, prevention and treatment. *Anesthesia*. 1999; 54(5): 44-453.
 17. Huh H, Go DY, Cho JE, Park J, Lee J, Kim HC. Influence of two-handed jaw thrust during tracheal intubation on postoperative sore throat: a prospective randomised study. *J Int Med Res*. 202 1;49(2):300060520961237.
 18. Hohlrieder M, Brimacombe J, Eschertzhuber S, Ulmer H, Keller C. A study of airway management using the ProSeal LMA laryngeal mask airway compared with the tracheal tube on postoperative analgesia requirements following gynaecological laparoscopic surgery. *Anaesthesia*. 2007;62 (9):913-918.
 19. Dobrin P, Canfield T. Cuffed endotracheal tubes: mucosal pressures and tracheal wall blood flow. *Am J Surg*. 1977;133(5):562-568.
 20. Grillo HC, Donahue DM, Mathisen DJ, Wain JC, Wright CD. Postintubation

- tracheal stenosis. Treatment and results. *J Thorac Cardiovasc Surg.* 1995;109(3):486–492; discussion 492–483.
21. Ebneshahidi A, Mohseni M. Strepsils(R) tablets reduce sore throat and hoarseness after tracheal intubation. *Anesth Analg.* 2010;111(4) :892–894.
 22. Kloub R. Sore throat following tracheal intubation. *Middle East J Anaesthesiol.* 2001;16(1):29–40.
 23. Mitobe Y, Yamaguchi Y, Baba Y, et al. A literature review of factors related to postoperative sore throat. *J Clin Med Res.* 2022;14(2):88–94.
 24. Feine JS, Bushnell CM, Miron D, Duncan GH. Sex differences in the perception of noxious heat stimuli. *Pain.* 1991;44(3):255–262.
 25. Lautenbacher S, Strian F. Sex differences in pain and thermal sensitivity: the role of body size. *Percept Psychophys.* 1991;50(2):179–183.
 26. Ali A, Altun D, Oguz BH, Ilhan M, Demircan F, Koltka K. The effect of preoperative anxiety on postoperative analgesia and anesthesia recovery in patients undergoing laparoscopic cholecystectomy. *J Anesth.* 2014;28(2):222–227.
 27. Birhanu Mengistu S, Akalu L. Magnitude and Associated Risk Factors of Post-Operative Sore Throat Following Surgery by General Anesthesia with Endotracheal Intubation. *Int J Anesth Res.* 2017;5(2): 409-413.